# PATENT ABSTRACTS OF JAPAN

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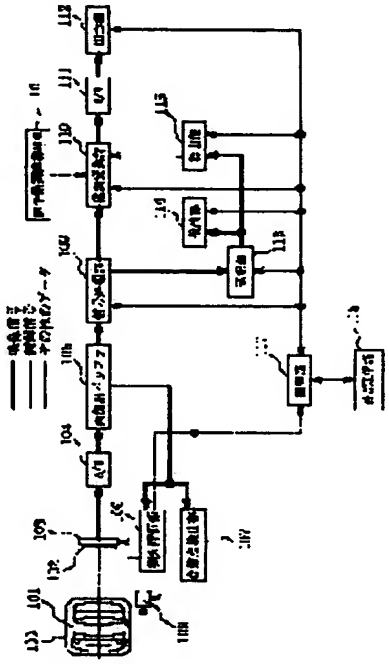
## (54) IMAGING SYSTEM

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an imaging system which automatically adjusts a timing to calculate a gradation change curve to make the timing optimum in response to the change of scenes or imaging conditions, without being affected by the screen position of an object or a minute change in the screen, in order to carry out gradation change and obtain an image with its graduation changed.
SOLUTION: The imaging system comprises a selection means 113 for selecting one image among a group of shot images having M bit gradation width at a time interval based on an imaging condition; a detecting means 114 for detecting the change of characteristic information between sequentially selected images; a calculation means 115 for calculating the graduation change curve of an image that is selected on the basis of a detection result by the detection means; and a graduation change means 110 for changing the image group with M bit graduation width to an image group with N bit graduation width (M, N stand for natural numbers, M≥N) through graduation change, based on the detection result by the detection means 114, using a new graduation change curve calculated by the calculation means 115 when a characteristic information change is detected, and using the present graduation change curve when a characteristic information change is not detected.



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## CLAIMS

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[Claim(s)]
[Claim 1] In the image pick-up system which changes and outputs the image group of the M bit gradation width of face which follows a time series target from an image pick-up system to the image group of N bit gradation width of face (M and N are M>=N at the natural number) of an output system A selection means to choose the image of one sheet with the time interval based on photography conditions from the image groups of the above-mentioned M bit gradation width of face, A detection means to detect change of the property information between the images by which sequential selection was made with the above-mentioned selection means, A calculation means to compute the gray-scale-conversion curve of the image chosen by the above-mentioned selection means based on the detection result in the above-mentioned detection means, Based on the detection result in the above-mentioned detection means, the new gray-scale-conversion curve computed with the above-mentioned calculation means when change of the above-mentioned property information was detected is used. It is the image pick-up system characterized by having a gray-scale-conversion means to change the image group of the above-mentioned M bit gradation width of face into the image group of the above-mentioned N bit gradation width of face using a current gray-scale-conversion curve, respectively when change of the above-mentioned property information is not detected.
[Claim 2] In the image pick-up system which changes and outputs the image group of the M bit gradation width of face which follows a time series target from an image pick-up system to the image group of N bit gradation width of face (M and N are M>=N at the natural number) of an output system A selection means to choose the image of one sheet with the time interval based on photography conditions from the image groups of the above-mentioned M bit gradation width of face, A detection means to detect change of the property information between the images by which sequential selection was made with the above-mentioned selection means, A calculation means to compute alternatively the gray-scale-conversion curve of the image chosen by the above-mentioned selection means based on the detection result in the above-mentioned detection means, A record means to record as a group two or more gray-scale-conversion curves computed with the above-mentioned calculation means to the property information on the image chosen with the above-mentioned selection means, and the image concerned, The new gray-scale-conversion curve computed with the above-mentioned calculation means based on the detection result in the above-mentioned detection means when change of the above-mentioned property information was detected, Or the gray-scale-conversion curve of the past currently recorded on the above-mentioned record means is used. It is the image pick-up system characterized by having a gray-scale-conversion means to change the image group of the above-mentioned M bit gradation width of face into the image group of the above-mentioned N bit gradation width of face using a current gray-scale-conversion curve, respectively when change of the above-mentioned property information is not detected.
[Claim 3] The image pick-up system characterized by having a synthetic means to compound the image of at least two frames further picturized on different exposure conditions to the same photographic subject in the image pick-up system according to claim 1 or 2, or a field unit, and to generate an image group with a gradation width of face of M above-mentioned bits.
[Claim 4] Based on at least one photography condition of the image number of sheets by which the above-mentioned selection means is photoed by per unit time amount by the above-mentioned image pick-up system in an image pick-up system according to claim 1, 2, or 3, image size, exposure conditions, focus conditions, white balance conditions, a zoom location, and a camera location, it is the image pick-up system characterized by having a time setting means to set up the above-mentioned time interval.
[Claim 5] It is the image pick-up system characterized by having a contraction means to reduce the image with which selection of the above-mentioned selection means was made [ above-mentioned ] in the image

pick-up system given in any 1 term of claims 1-4.
[Claim 6] It is the image pick-up system characterized by being constituted so that the image by which selection was made [ above-mentioned ] so that the amount of information which processes the above-mentioned contraction means to per unit time amount in an image pick-up system according to claim 5 based on the above-mentioned time interval might become below constant value may be reduced in application.
[Claim 7] It is the image pick-up system carry out having a decision means judge the existence of scene change based on change of the average intensity level between the sequential images computed with a brightness calculation means compute the average intensity level of the image as which the above-mentioned detection means was chosen with the above-mentioned selection means as the above-mentioned property information in the image pick-up system given in any 1 term of claims 1-6, and the above-mentioned brightness calculation means as the description.
[Claim 8] It is the image pick-up system characterized by to have a motion vector calculation means compute the sequential image lost-motion vector of two sheets as which the above-mentioned detection means was chosen with the above-mentioned selection means as the above-mentioned property information in the image pick-up system given in any 1 term of claims 1-6, and a decision means judge the existence of scene change based on the motion vector computed with the above-mentioned motion vector calculation means.
[Claim 9] It is the image pick-up system characterized by to have a decision means judge the existence of scene change based on change of the histogram between the sequential images computed with a histogram calculation means compute a histogram, and the above-mentioned histogram calculation means from the image as which the above-mentioned detection means was chosen with the above-mentioned selection means as the above-mentioned property information in an image pick-up system given in any 1 term of claims 1-6.
[Claim 10] In an image pick-up system according to claim 2 or 3 the above-mentioned detection means A similarity calculation means to compute the similarity of the property information on the image chosen with the above-mentioned selection means, and two or more property information currently recorded on the above-mentioned record means, The image pick-up system characterized by having the read-out means which reads the gray-scale-conversion curve which makes similar property information and a group concerned from the above-mentioned record means when the similarity computed with the above-mentioned similarity calculation means fulfills predetermined conditions.
[Claim 11] In an image pick-up system given in any 1 term of claims 1-6 the above-mentioned detection means A photography condition detection means to detect the exposure conditions of the image chosen with the above-mentioned selection means, or the photography conditions of focus conditions as change of the above-mentioned property information, The image pick-up system characterized by having a decision means to judge the existence of scene change based on change of the photography conditions between the sequential images detected with the above-mentioned photography condition detection means.
[Claim 12] In an image pick-up system given in any 1 term of claims 1-11 the above-mentioned calculation means A separation means to divide into a luminance signal and a color-difference signal the image chosen with the above-mentioned selection means, An extract means to extract a proper exposure region based on the luminance-signal level separated with the above-mentioned separation means, A characteristic quantity calculation means to compute the characteristic quantity about the proper exposure region extracted with the above-mentioned extract means, The image pick-up system characterized by having a histogram creation means to create a histogram based on the characteristic quantity computed with the above-mentioned characteristic quantity calculation means, and a gray-scale-conversion curvilinear calculation means to compute a gray-scale-conversion curve based on the histogram created with the above-mentioned histogram creation means.
[Claim 13] The above-mentioned calculation means is an image pick-up system characterized by having the control means controlled to make a gray-scale-conversion curve compute with the above-mentioned calculation means only when change of property information is further detected by the above-mentioned detection means in an image pick-up system given in any 1 term of claims 1-12.
[Claim 14] In an image pick-up system according to claim 2 or 3 the above-mentioned record means The property information and a gray-scale-conversion curvilinear record means to record the above-mentioned property information and a gray-scale-conversion curve, A monitor means to supervise the residue of the record section of the above-mentioned property information and gray-scale-conversion curvilinear record means, The hysteresis management tool which manages the hysteresis of the gray-scale-conversion curve

read from the above-mentioned gray-scale-conversion means, When the residue of the record section of the above-mentioned property information and gray-scale-conversion curvilinear record means becomes below a predetermined value based on the monitor result in the above-mentioned monitor means The image pick-up system characterized by having a cancellation means to cancel property information with few counts of read-out, and a gray-scale-conversion curve from the above-mentioned property information and gray-scale-conversion curvilinear record means, based on the hysteresis monitor result in the above-mentioned hysteresis management tool.

[Claim 15] The image pick-up system which carries out [ having a standard gray-scale-conversion curvilinear record means record a standard gray-scale-conversion curve further in an image pick-up system given in any 1 term of claims 1-14, an initialization detection means detect initialization situations, such as a power up, and a transfer means transmit the standard gray-scale-conversion curve currently recorded by the above-mentioned standard gray-scale-conversion curvilinear record means based on the output of the above-mentioned initialization detection means to the above-mentioned gray-scale-conversion means, and ] as the description.

[Claim 16] A standard gray-scale-conversion curvilinear record means to record a standard gray-scale-conversion curve on any 1 term of claims 1-14 further in the image pick-up system of a publication, A photography condition detection means to detect change of photography conditions based on at least one of the image number of sheets photoed by per unit time amount, image size, exposure conditions, focus conditions, white balance conditions, a zoom location, and the camera locations from the above-mentioned image pick-up system, A transfer means to transmit the standard gray-scale-conversion curve currently recorded on the above-mentioned standard gray-scale-conversion curvilinear record means based on the detection result in the above-mentioned photography condition detection means to the above-mentioned gray-scale-conversion means, The image pick-up system characterized by having the resetting means as which set the time interval of the image selection in the above-mentioned selection means as zero based on the detection result in the above-mentioned photography condition detection means, and an image at present is made to choose it.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the image pick-up system which obtains a high definition output image by updating appropriately the gray-scale-conversion curve which changes gradation width of face in application with respect to an image pick-up system with the gradation width of face of the image pick-up system which obtains an image serially wider than the gradation width of face in an output system.
[0002]
[Description of the Prior Art] For example, in a digital camcorder, in order to prevent image quality degradation by the cancellation of significant digits of digital system signal processing, to the gradation width of face (usually 8 bits) of a final output image, it is more large and the gradation width of face of the image in an input and a processor is usually set as about 10-12 bits. In this case, it is necessary to perform gray scale conversion so that it may agree to the gradation width of face of an output system. Moreover, the technique of generating an extensive dynamic range image with more wide gradation width of face is also proposed by compounding the image of two or more sheets with which light exposure differs. It is necessary to carry out gray scale conversion of the extensive dynamic range image obtained also in this case so that it may agree to the gradation width of face of an output system.
[0003] As an approach of performing the above-mentioned gray scale conversion, conventionally, the fixed gamma curve doubled with the standard scene and the application gray-scale-conversion curve based on a histogram etc. perform gray scale conversion, or an image is captured for every fixed time amount as indicated by JP,2000-307896,A, and the method of performing gray scale conversion based on the brightness statistic of the specific region (for example, center of an image) of the captured image is proposed.
[0004]
[Problem(s) to be Solved by the Invention] However, if a gray-scale-conversion curve is not computed to suitable timing to compensate for the scene change at the time of photography when suitable gray scale conversion cannot be performed according to the scene which changes in performing gray scale conversion fixed by gamma conversion etc. and the application gray-scale-conversion curve based on a histogram etc. performs gray scale conversion, there is a problem that suitable gray scale conversion cannot be performed.
[0005] moreover, in capturing an image for every fixed time amount and performing gray scale conversion based on the brightness statistic of the specific region as indicated by above-mentioned JP,2000-307896,A Since a gray-scale-conversion curve is not computed unless timing suits even if there is much futility and scene change occurs, in order to compute, even when there is no need of there being no scene change and computing a gray-scale-conversion curve, There is a problem that suitable gray scale conversion cannot be performed according to scene change.
[0006] Furthermore, since a gray-scale-conversion curve is periodically updated while there is a problem that it cannot respond to detection of scene change in the other field, since specific regions, such as a center of an image, are set up, there is also a problem of spoiling the stability of a screen.
[0007] Moreover, recently, animation distribution by the network etc. is performed. In this case, with the above-mentioned conventional technique, although image size, a frame rate, etc. change with the conditions of distribution, since the timing which computes a gray-scale-conversion curve corresponding to change of image size or a frame rate cannot be adjusted automatically, there is a problem that suitable gray scale conversion cannot be performed.
[0008] therefore , the purpose of this invention made in view of this point be to offer the image pick-up system by which the stable gray scale conversion screen be obtain while the timing which compute the gray

scale conversion curve which change the gradation width of face of the image obtain serially can adjust the optimal automatically to compensate for scene change or change of photography conditions and it can always carry out the gray scale conversion of it appropriately , without be influence by the screen location of a photographic subject , and minute screen change .
[0009]
[Means for Solving the Problem] Invention concerning claim 1 which attains the 1st purpose of the above In the image pick-up system which changes and outputs the image group of the M bit gradation width of face which follows a time series target from an image pick-up system to the image group of N bit gradation width of face (M and N are M>=N at the natural number) of an output system A selection means to choose the image of one sheet with the time interval based on photography conditions from the image groups of the above-mentioned M bit gradation width of face, A detection means to detect change of the property information between the images by which sequential selection was made with the above-mentioned selection means, A calculation means to compute the gray-scale-conversion curve of the image chosen by the above-mentioned selection means based on the detection result in the above-mentioned detection means, Based on the detection result in the above-mentioned detection means, the new gray-scale-conversion curve computed with the above-mentioned calculation means when change of the above-mentioned property information was detected is used. When change of the above-mentioned property information is not detected, it is characterized by having a gray-scale-conversion means to change the image group of the above-mentioned M bit gradation width of face into the image group of the above-mentioned N bit gradation width of face, respectively, using a current gray-scale-conversion curve.
[0010] According to invention concerning claim 1, in a selection means, an image is extracted to suitable timing based on photography conditions. When change of the property information on the extracted sequential image is detected by the detection means Based on the image extracted with the selection means, a gray-scale-conversion curve is computed with a calculation means. When the image group of M bit gradation width of face is changed into the image group of N bit gradation width of face by the gray-scale-conversion means using the newly computed gray-scale-conversion curve and change of property information is not detected by the detection means Since the image group of M bit gradation width of face is changed into the image group of N bit gradation width of face with the gray-scale-conversion curve which is carrying out current use in the gray-scale-conversion means Useless count can be excluded, and a gray-scale-conversion curve can be automatically set up to suitable timing to compensate for scene change, therefore gray scale conversion can always be appropriately carried out to scene change, and the highly defined and stabilized gray-scale-conversion screen can be obtained.
[0011] In the image pick-up system which invention concerning claim 2 changes into the image group of N bit gradation width of face (M and N are M>=N at the natural number) of an output system the image group of the M bit gradation width of face which follows a time series target from an image pick-up system, and is outputted A selection means to choose the image of one sheet with the time interval based on photography conditions from the image groups of the above-mentioned M bit gradation width of face, A detection means to detect change of the property information between the images by which sequential selection was made with the above-mentioned selection means, A calculation means to compute alternatively the gray-scale-conversion curve of the image chosen by the above-mentioned selection means based on the detection result in the above-mentioned detection means, A record means to record as a group two or more gray-scale-conversion curves computed with the above-mentioned calculation means to the property information on the image chosen with the above-mentioned selection means, and the image concerned, The new gray-scale-conversion curve computed with the above-mentioned calculation means based on the detection result in the above-mentioned detection means when change of the above-mentioned property information was detected, Or the gray-scale-conversion curve of the past currently recorded on the above-mentioned record means is used. When change of the above-mentioned property information is not detected, it is characterized by having a gray-scale-conversion means to change the image group of the above-mentioned M bit gradation width of face into the image group of the above-mentioned N bit gradation width of face, respectively, using a current gray-scale-conversion curve.
[0012] According to invention concerning claim 2, in a selection means, an image is extracted to suitable timing based on photography conditions. When change of the property information on the extracted sequential image is detected by the detection means and the property information corresponding to the property information on the image concerned is not recorded on a record means While the property information on the image concerned by which a gray-scale-conversion curve is computed with a calculation means based on the image extracted with the selection means, and the newly computed gray-scale-

conversion curve and its scene are characterized is recorded on a record means as a group The image group of M bit gradation width of face is changed into the image group of N bit gradation width of face by the gray-scale-conversion means using the newly computed gray-scale-conversion curve. Moreover, when change of property information is detected by the detection means and the property information corresponding to the property information is recorded on the record means The image group of M bit gradation width of face is changed into the image group of N bit gradation width of face by the gray-scale-conversion means using the property information currently recorded on the record means, and a corresponding gray-scale-conversion curve. The image group of M bit gradation width of face is changed into the image group of N bit gradation width of face with the gray-scale-conversion curve which is carrying out current use in the gray-scale-conversion means, without computing a gray-scale-conversion curve with a calculation means, when change of property information is not detected by the detection means. Therefore, while being able to set up a gray-scale-conversion curve to suitable timing automatically to compensate for scene change, useless count is excluded, gray scale conversion can be carried out quickly and appropriately to scene change, and the highly defined and stabilized gray-scale-conversion screen can be obtained.

[0013] Invention concerning claim 3 is characterized by having a synthetic means to compound the image of at least two frames further picturized on different exposure conditions to the same photographic subject, or a field unit, and to generate an image group with a gradation width of face of M above-mentioned bits in an image pick-up system according to claim 1 or 2.

[0014] Since gray scale conversion is performed from the image more than the gradation width of face which can be treated by the image pick-up system by compounding the image of different exposure and generating the image of the extensive dynamic range of one sheet according to invention concerning claim 3, a more nearly high-definition image with few black crushing and white jumps can be obtained.

[0015] It is characterized by invention concerning claim 4 having a time setting means to set up the above-mentioned time interval based on at least one photography condition of the image number of sheets by which the above-mentioned selection means is photoed by per unit time amount by the above-mentioned image pick-up system, image size, exposure conditions, focus conditions, white balance conditions, a zoom location, and a camera location, in an image pick-up system according to claim 1, 2, or 3.

[0016] Since an image is chosen to the timing according to a photography situation in a selection means according to invention concerning claim 4, the detectivity of scene change improves.

[0017] It is characterized by having a contraction means by which invention concerning claim 5 reduces the image with which selection of the above-mentioned selection means was made [ above-mentioned ] in an image pick-up system given in any 1 term of claims 1-4.

[0018] Since the image chosen in the selection means is reduced and outputted according to invention concerning claim 5, latter processing can be mitigated and the system of low cost can be realized. Moreover, since minute change of an image is absorbed in the phase to reduce, the image by which the property of the gray-scale-conversion curve computed with a calculation means is stabilized, therefore gray scale conversion is carried out by that cause becomes legible. Furthermore, since scene change is detectable from not a specific region but the whole image, it becomes detectable [ the scene change by the location of a photographic subject ].

[0019] Invention concerning claim 6 is characterized by constituting the above-mentioned contraction means so that the image by which selection was made [ above-mentioned ] so that the amount of information processed to per unit time amount might become below constant value based on the above-mentioned time interval may be reduced in application in an image pick-up system according to claim 5.

[0020] Since the image chosen so that the amount of information processed to per unit time amount according to the time interval as which an image is chosen might become fixed is reduced according to invention concerning claim 6, it can prevent that gray scale conversion is performed to the timing which could not follow latter processing in footsteps but was delayed. Moreover, since minute change of an image is absorbed in the phase to reduce while the system of low cost is realizable, since latter processing is mitigated, the gray-scale-conversion curve stabilized in the latter calculation means is computable. Furthermore, since scene change is detectable from not a specific region but the whole image, it becomes detectable [ the scene change by the location of a photographic subject ].

[0021] Invention concerning claim 7 is set to an image pick-up system given in any 1 term of claims 1-6. The above-mentioned detection means A brightness calculation means to compute the average intensity level of the image chosen with the above-mentioned selection means as the above-mentioned property information, It is characterized by having a decision means to judge the existence of scene change based on change of the average intensity level between the sequential images computed with the above-mentioned

brightness calculation means.
[0022] Since scene change is detected from a serial change of the brightness value of the selected image according to invention concerning claim 7, scene change is detectable by the amount of little operations, and the low cost processor.
[0023] Invention concerning claim 8 carries out having a motion vector calculation means compute the sequential image lost-motion vector of two sheets chosen with the above-mentioned selection means, and a decision means judge the existence of scene change based on the motion vector computed with the above-mentioned motion vector calculation means as the description as the above-mentioned property information in the above-mentioned detection means in an image pick-up system given in any 1 term of claims 1-6.
[0024] Since scene change is detected based on a serial change of a motion vector according to invention concerning claim 8, the gray scale conversion which put weight on main photographic subjects becomes possible, and a high-definition image can be obtained.
[0025] Invention concerning claim 9 carries out having a decision means judge the existence of scene change from the image chosen with the above-mentioned selection means based on change of the histogram between the sequential images computed with a histogram calculation means compute a histogram, and the above-mentioned histogram calculation means as the description as the above-mentioned property information in the above-mentioned detection means in an image pick-up system given in any 1 term of claims 1-6.
[0026] Since scene change is detected from a serial change of a histogram according to invention concerning claim 9, scene change is detectable by the amount of comparatively little operations, and the low cost processor. Moreover, the detectivity of scene change can be improved by putting weight on the middle gradation except an umbra or a bright section.
[0027] Invention concerning claim 10 is set to an image pick-up system according to claim 2 or 3. The above-mentioned detection means A similarity calculation means to compute the similarity of the property information on the image chosen with the above-mentioned selection means, and two or more property information currently recorded on the above-mentioned record means, When the similarity computed with the above-mentioned similarity calculation means fulfills predetermined conditions, it is characterized by having the read-out means which reads the gray-scale-conversion curve which makes similar property information and a group concerned from the above-mentioned record means.
[0028] Since similarity with the property information on the past currently recorded on the record means searches for, and gray scale conversion is performed using the gray-scale-conversion curve of the past which makes the property information and the group of the past, and is recorded according to invention concerning claim 10 when similarity is high when scene change is detected, it becomes possible to omit the time and effort which computes a gray-scale-conversion curve in the case of a similar scene, and high-speed processing is attained.
[0029] Invention concerning claim 11 is set to an image pick-up system given in any 1 term of claims 1-6. The above-mentioned detection means A photography condition detection means to detect the exposure conditions of the image chosen with the above-mentioned selection means, or the photography conditions of focus conditions as change of the above-mentioned property information, It is characterized by having a decision means to judge the existence of scene change based on change of the photography conditions between the sequential images detected with the above-mentioned photography condition detection means.
[0030] Since scene change is detected based on change of the exposure conditions of an image, or the photography conditions of focus conditions according to invention concerning claim 11, to compensate for change of photography conditions, a gray-scale-conversion curve can be automatically set up to suitable timing.
[0031] Invention concerning claim 12 is set to an image pick-up system given in any 1 term of claims 1-11. The above-mentioned calculation means A separation means to divide into a luminance signal and a color-difference signal the image chosen with the above-mentioned selection means, An extract means to extract a proper exposure region based on the luminance-signal level separated with the above-mentioned separation means, A characteristic quantity calculation means to compute the characteristic quantity about the proper exposure region extracted with the above-mentioned extract means, It is characterized by having a histogram creation means to create a histogram based on the characteristic quantity computed with the above-mentioned characteristic quantity calculation means, and a gray-scale-conversion curvilinear calculation means to compute a gray-scale-conversion curve based on the histogram created with the above-mentioned histogram creation means.
[0032] Since a gray-scale-conversion curve is computed based on the histogram showing the characteristic

quantity in the proper exposure region of the image chosen with the selection means according to invention concerning claim 12, the gray-scale-conversion curve which removed the flat background and put weight on main photographic subjects can be computed, and a high-definition image can be obtained.
[0033] It is characterized by having the control means which controls invention concerning claim 13 in an image pick-up system given in any 1 term of claims 1-12 so that the above-mentioned calculation means makes a gray-scale-conversion curve compute with the above-mentioned calculation means further, only when change of property information is detected by the above-mentioned detection means.
[0034] Since according to invention concerning claim 13 a gray-scale-conversion curve is computed only when scene change is detected, while being able to omit calculation of an unnecessary gray-scale-conversion curve and attaining high-speed processing, the latter burden of processing is mitigable.
[0035] Invention concerning claim 14 is set to an image pick-up system according to claim 2 or 3. The above-mentioned record means The property information and a gray-scale-conversion curvilinear record means to record the above-mentioned property information and a gray-scale-conversion curve, A monitor means to supervise the residue of the record section of the above-mentioned property information and gray-scale-conversion curvilinear record means, The hysteresis management tool which manages the hysteresis of the gray-scale-conversion curve read from the above-mentioned gray-scale-conversion means, When the residue of the record section of the above-mentioned property information and gray-scale-conversion curvilinear record means becomes below a predetermined value based on the monitor result in the above-mentioned monitor means It is characterized by having a cancellation means to cancel property information with few counts of read-out, and a gray-scale-conversion curve from the above-mentioned property information and gray-scale-conversion curvilinear record means, based on the hysteresis monitor result in the above-mentioned hysteresis management tool.
[0036] When the residue of the record section in the property information and a gray-scale-conversion curvilinear record means to record the property information and the gray-scale-conversion curve of an image decreases according to invention concerning claim 14 Since the count of read-out is canceled from the minimum gray-scale-conversion curve and the property information corresponding to it, when scene change arises, what has the high frequency used in the past will continue being saved preferentially, and becomes possible [ realizing high-speed processing ].
[0037] Invention concerning claim 15 is set to an image pick-up system given in any 1 term of claims 1-14. Furthermore, a standard gray-scale-conversion curvilinear record means to record a standard gray-scale-conversion curve, It is characterized by having an initialization detection means to detect initialization situations, such as a power up, and a transfer means to transmit the standard gray-scale-conversion curve currently recorded on the above-mentioned standard gray-scale-conversion curvilinear record means based on the output of the above-mentioned initialization detection means to the above-mentioned gray-scale-conversion means.
[0038] Since according to invention concerning claim 15 the gray-scale-conversion curve used as the criterion currently recorded beforehand is set up when judged as an initialization situation, also in the situation that gray-scale-conversion curves, such as a power up, are not computed, gray scale conversion becomes possible.
[0039] Invention concerning claim 16 is set to an image pick-up system given in any 1 term of claims 1-14. Furthermore, a standard gray-scale-conversion curvilinear record means to record a standard gray-scale-conversion curve, A photography condition detection means to detect change of photography conditions based on at least one of the image number of sheets photoed by per unit time amount, image size, exposure conditions, focus conditions, white balance conditions, a zoom location, and the camera locations from the above-mentioned image pick-up system, A transfer means to transmit the standard gray-scale-conversion curve currently recorded on the above-mentioned standard gray-scale-conversion curvilinear record means based on the detection result in the above-mentioned photography condition detection means to the above-mentioned gray-scale-conversion means, It is characterized by having the resetting means as which set the time interval of the image selection in the above-mentioned selection means as zero based on the detection result in the above-mentioned photography condition detection means, and an image at present is made to choose it.
[0040] Since according to invention concerning claim 16 a new gray-scale-conversion curve is computed by the image immediately after modification while being able to acquire a gradation resolution picture with few breakdowns, since a standard gray-scale-conversion curve is set up when photography conditions are changed, a high-definition gradation resolution picture is generable in a short time.
[0041]

[Embodiment of the Invention] Hereafter, the gestalt of operation of the image pick-up system by this invention is explained with reference to drawing 1 - drawing 10 .
[0042] The block diagram in which drawing 1 - drawing 6 show the gestalt of the 1st operation of this invention, and drawing 1 shows the configuration of the whole image pick-up system, The block diagram showing the configuration of an example of the selection section which shows drawing 2 to drawing 1 , the explanatory view of the function [ in / in drawing 3 / the selection section ] for time setting, The block diagram showing the configuration of an example of the detecting element which shows drawing 4 to drawing 1 , the block diagram showing the configuration of an example of the calculation section which shows drawing 5 to drawing 1 , and drawing 6 are the block diagrams showing the configuration of an example of the gradation transducer shown in drawing 1 .
[0043] In the image pick-up system shown in drawing 1 , the image of an animation etc. is photoed by the image pick-up system which has CCD103 of a lens system 100, diaphragm 101, a low pass filter 102, and a veneer type, the analog video signal outputted from CCD103 of this image pick-up system is changed into a digital signal with A/D converter 104, and it transmits to the photometry evaluation section 106, the focusing point detecting element 107, and the signal-processing section 109 through the buffer 105 for images, respectively.
[0044] It connects with diaphragm 101 and CCD103, respectively, and the photometry evaluation section 106 connects the focusing point detecting element 107 to the AF motor 108. moreover, the signal-processing section 109 should pass the gradation transducer (gray-scale-conversion means) 110 and D/A converter 111 -- while connecting with the output sections 112, such as a monitor and a videocassette recorder, pass the selection section (selection means) 113 -- it connects with a detecting element (detection means) 114 and the calculation section (calculation means) 115, respectively. Moreover, the calculation section 115 and the standard gradation curve (standard gradation curvilinear record means) ROM 116 are connected to the gradation transducer 110, respectively.
[0045] It connects with the control sections 117, such as a microcomputer, further, and the above-mentioned photometry evaluation section 106, the focusing point detecting element 107, the signal-processing section 109, the gradation transducer 110, the output section 112, the selection section 113, a detecting element 114, and the calculation section 115 connect the external I/F section 118 equipped with the interface for changing an electric power switch, a shutter carbon button, and various modes at the time of photography further to a control section 117. Here, a control section 117 constitutes the control means which controls the whole actuation, and also constitutes an initialization detection means, a photography condition detection means, and a resetting means. In addition, in drawing 1 , drawing 2 and drawing 4 - drawing 6 , the signal line which the signal line which the signal line shown as the continuous line of a thick wire shows video-signal Rhine, and is shown as the continuous line of a thin line shows control signal Rhine, and is shown with a broken line shows other data lines.
[0046] A user specifies photography conditions, such as image size and a frame number, through the external I/F section 118, and the image pick-up system shown in drawing 1 starts photography by pushing a shutter carbon button after that. The video signal acquired from CCD103 by this photography initiation is changed into a digital signal with A/D converter 104, and is transmitted and stored in the buffer 105 for images. With the gestalt of this operation, gradation width of face of the digitized signal is made into 12 bits.

[0047] The video signal transmitted to the buffer 105 for images is transmitted to the photometry evaluation section 106 and the focusing point detecting element 107, respectively. The intensity level in an image (exposure conditions) is computed from a video signal, it extracts becoming proper exposure based on the intensity level, and 101, the electronic shutter rate of CCD103, etc. are controlled by the photometry evaluation section 106. Moreover, the AF motor 108 is controlled by the focusing point detecting element 107 so that the edge reinforcement in an image (focus conditions) is detected from a video signal and the edge reinforcement serves as max, namely, so that a focus image is obtained. The conditions at the time of photography of the exposure conditions computed in these photometries evaluation section 106, the focus conditions detected by the focusing point detecting element 107 are transmitted to a control section 117.
[0048] In the signal-processing section 109, the video signal of the veneer condition on the buffer 105 for images is read into the basis of control of a control section 117, based on the video signal, well-known interpolation processing, white balance processing, emphasis processing, etc. are performed, the video signal of 3 tabular voice is generated, the generated video signal is chosen at intervals of predetermined time by the selection section 113, and it transmits to a detecting element 114.
[0049] In a detecting element 114, the property information already computed from the image which

computed predetermined property information from the selected video signal (image), and was chosen the computed property information and last time is compared, the existence of scene change is detected, and the result is transmitted to a control section 117.

[0050] When scene change is detected based on the signal from a detecting element 114, it controls by the control section 117 to compute a new gray-scale-conversion curve based on the image chosen in the selection section 113 in the calculation section 115, and to transmit to the gradation transducer 110.

[0051] On the other hand, it controls to make the use of a gray-scale-conversion curve which is carrying out current use in the gradation transducer 110 continue, without computing a new gray-scale-conversion curve in the calculation section 115, when scene change is not detected. In addition, when a control section 117 detects initialization situations, such as a power up, it controls to read the gray-scale-conversion curve stored in the standard gradation curve ROM 116 in the gradation transducer 110.

[0052] In the gradation transducer 110, it changes so that the signal from the signal-processing section 109 may be adjusted to the gradation width of face of an output system based on the gray-scale-conversion curve obtained as mentioned above. With the gestalt of this operation, gradation width of face of an output system is made into 8 bits. The digital video signal outputted from this gradation transducer 110 is changed into the video signal of an analog with D/A converter 111, and is outputted to the output sections 112, such as a monitor and a videocassette recorder.

[0053] Next, the detailed configuration and actuation of each part of the above-mentioned selection section 113, a detecting element 114, the calculation section 115, and the gradation transducer 110 are explained.

[0054] Drawing 2 is the block diagram showing the configuration of an example of the selection section 113. This selection section 113 has the time setting section (time setting means) 200, ROM201 for functions, the image reading section 202, the contraction section (contraction means) 203, and the buffer 204 for contraction images. It connects with a control section 117, ROM201 for functions, and the image reading section 202, and the time setting section 200 connects the image reading section 202 to a control section 117, the signal-processing section 109, and the contraction section 203 further, it connects the contraction section 203 to the buffer 204 for contraction images further, and connects the buffer 204 for contraction images to a detecting element 114 and the calculation section 115 further, respectively.

[0055] The information from the photometry evaluation section 106, the focusing point detecting element 107, and the external I/F section 118 is transmitted to the time setting section 200 through a control section 117. In the time setting section 200, the time interval which chooses an image from the function set as ROM201 for functions based on information acquired from the external I/F section 118, such as image size and a frame number, is determined.

[0056] Drawing 3 shows an example of the function for time setting set as ROM201 for functions. A time interval is set up for a long time as image size or a frame number becomes large so that the load to a latter processor may not increase this time setting function.

[0057] In addition, when a frame number is 0, static-image photography will be meant, the time interval in this case will be set to 0, and all images will be chosen. Moreover, the time setting section 200 judges that scene change arose, when the photometry from the photometry evaluation section 106 and the focusing point detecting element 107 and focus conditions change suddenly, and it sets a time interval as 0. It is also possible to use information, such as a white balance, a zoom location of a lens, and migration of a camera, and to detect scene change besides this. Furthermore, when possibility that an image will fail [ scene variation ] in the present gray-scale-conversion curve exceeding a predetermined value is high, it is also possible to switch to the gray-scale-conversion curve of the standard gradation curve ROM 116, without waiting for calculation of a new gray-scale-conversion curve. Moreover, the escape of preparing two or more above-mentioned functions for time setting, and switching according to the purpose is also possible.

[0058] The image reading section 202 reads the signal from the signal-processing section 109 with a predetermined time interval based on control by the time setting section 200, and transmits it to the contraction section 203. The contraction section 203 carries out contraction processing of the image with the reduction percentage defined beforehand, for example, 1 / 8 grades, and transmits and stores it in the buffer 204 for contraction images. In addition, it is not necessary to make immobilization reduction percentage in the contraction section 203, and it may be made adjustable. For example, it is also possible to control reduction percentage so that the amount of information within unit time amount is calculated from contraction image size and the time interval to choose and this amount of information becomes below constant value.

[0059] The buffer 204 for contraction images is a ring-like buffer which can record the contraction image of two or more sheets, and if a buffer fills, it is constituted so that it may overwrite from an old image. The

contraction image in this buffer 204 for contraction images is transmitted to a detecting element 114 or the calculation section 115.

[0060] Drawing 4 is the block diagram showing the configuration of an example of a detecting element 114. This detecting element 114 has the brightness calculation section (brightness calculation means) 300, the buffer 301 for brightness values, and the decision section (decision means) 302. It connects with the decision section 302 through the buffer 301 for brightness values, and the brightness calculation section 300 connects the decision section 302 to a control section 117 further while connecting with a control section 117 and the selection section 113, respectively.

[0061] The brightness calculation section 300 captures the above-mentioned contraction image from the selection section 113 based on control by the control section 117, and computes the average luminance value of a contraction image. This average luminance value is transmitted to the buffer 301 for brightness values, and is saved. The buffer 301 for brightness values is a ring-like buffer which records an average luminance value, and if a buffer fills, it is constituted so that it may overwrite from an old average luminance value.

[0062] The decision section 302 supervises a serial change of the average luminance value from the buffer 301 for brightness values, and when the change beyond a predetermined threshold carries out count continuation of predetermined and it generates, it judges that scene change arose. This decision result is transmitted to a control section 117.

[0063] Drawing 5 is the block diagram showing the configuration of an example of the calculation section 115. This calculation section 115 has the brightness calculation section (separation means) 400, the proper exposure extract section (extract means) 401, the edge extract section (characteristic quantity calculation means) 402, the histogram creation section (histogram creation means) 403, and the conversion curvilinear calculation section (gray-scale-conversion curvilinear calculation means) 404. It connects with the edge extract section 402 through the proper exposure extract section 401, and the brightness calculation section 400 is connected to the conversion curvilinear calculation section 404 through the histogram creation section 403 while connecting with a control section 117 and the selection section 113, respectively. As for the proper exposure extract section 401, it connects with a control section 117 further, and it connects with the proper exposure extract section 401 and the edge extract section 402 further, respectively, and the histogram creation section 403 connects the conversion curvilinear calculation section 404 to a control section 117 and the gradation transducer 110 further, respectively.

[0064] The brightness calculation section 400 computes the brightness by capturing the above-mentioned contraction image of the selection section 113, when scene change is detected by the basis of control by the control section 117 by the detecting element 114. The luminance signal computed in this brightness calculation section 400 extracts the luminance signal below the threshold of a bright section as a fitness exposure region in the proper exposure extract section 401 as compared with the predetermined threshold (if it is for example, 12-bit gradation, an umbra is "128" and a bright section is "3968") about an umbra and a bright section above the threshold of an umbra, and transmits it to the edge extract section 402 and the histogram creation section 403, respectively.

[0065] In the edge extract section 402, well-known edge detection is performed to the luminance signal from the proper exposure extract section 401, the pixel which has the edge reinforcement beyond a predetermined threshold is extracted as the edge section, and the information is transmitted to the histogram creation section 403.

[0066] Based on the information on the above-mentioned fitness exposure region, and the information on the edge section, out of the luminance signal from the brightness calculation section 400, the histogram of the luminance signal in the edge section of the area within proper exposure is created, and it transmits to the conversion curvilinear calculation section 404 in the histogram creation section 403.

[0067] In the conversion curvilinear calculation section 404, it asks for a gray-scale-conversion curve by accumulating the histogram from the histogram creation section 403, and it is transmitted to the gradation transducer 110.

[0068] Drawing 6 is the block diagram showing the configuration of an example of the gradation transducer 110. This gradation transducer 110 has the Y/C separation section 500, the luminance-signal buffer 501, the color-difference-signal buffer 502, the brightness amendment section 503, the gray-scale-conversion curvilinear reading section (transfer means) 504, the amendment luminance-signal buffer 505, the color difference amendment section 506, and the Y/C composition section 507.

[0069] The Y/C separation section 500 is connected to the luminance-signal buffer 501 and the color-difference-signal buffer 502, respectively while connecting with the signal-processing section 109. The

luminance-signal buffer 501 is connected to the Y/C composition section 507 through the brightness amendment section 503 and the amendment luminance-signal buffer 505 while connecting with the color difference amendment section 506 further. The color-difference-signal buffer 502 is further connected to the Y/C composition section 507 through the color difference amendment section 506. Moreover, it connects with the color difference amendment section 506 further, and the amendment luminance-signal buffer 505 connects the Y/C composition section 507 to D/A converter 111 further. Furthermore, the gray-scale-conversion curvilinear reading section 504 is connected to the brightness amendment section 503 while connecting with the calculation section 115 and the standard gradation curve ROM 116. Furthermore, the Y/C separation section 500, the brightness amendment section 503, the gray-scale-conversion curvilinear reading section 504, the above-mentioned color difference amendment section 506, and the above-mentioned Y/C composition section 507 are connected to a control section 117, respectively.

[0070] It separates into a luminance signal and a color-difference signal in the Y/C separation section 500, and a luminance signal is stored in the luminance-signal buffer 501, and the video signal from the signal-processing section 109 stores a color-difference signal in the color-difference-signal buffer 502, respectively. Moreover, the gray-scale-conversion curvilinear reading section 504 reads the new gray-scale-conversion curve from the calculation section 115, when the gray-scale-conversion curve of the criterion stored in the standard gradation curve ROM 116 when initialization situations, such as powering on, are detected is read into the basis of control by the control section 117 and scene change is detected by the detecting element 114.

[0071] The luminance signal stored in the luminance-signal buffer 501 is transmitted to the brightness amendment section 503 and the color difference amendment section 506, respectively. In the brightness amendment section 503, the luminance signal from the luminance-signal buffer 501 is changed into 8 bits with the gradation width of face of an output system, and the gestalt of this operation based on the predetermined gray-scale-conversion curve read into the gray-scale-conversion curvilinear reading section 504, and the changed luminance signal is transmitted to the Y/C composition section 507 and the color difference amendment section 506 through the amendment luminance-signal buffer 505, respectively.

[0072] Moreover, the color-difference signal stored in the color-difference-signal buffer 502 is transmitted to the color difference amendment section 506. In the color difference amendment section 506, the correction factor which amends a color-difference signal based on the luminance signal before and behind the gray scale conversion from the luminance-signal buffer 501 and the amendment luminance-signal buffer 505 and the theoretical marginal model with which a color may exist is computed, this computed correction factor amends the color-difference signal from the color-difference-signal buffer 502, and that amended color-difference signal is transmitted to the Y/C composition section 507.

[0073] In the Y/C composition section 507, the luminance signal after the gray scale conversion from the amendment luminance-signal buffer 505 and the color-difference signal amended from the color difference amendment section 506 are compounded, and the compounded video signal is transmitted to D/A converter 111.

[0074] Thus, the image picturized serially is received with the gestalt of this operation. An image is chosen with the time interval which was suitable for photography conditions, such as image size and a frame number, in the selection section 113. Based on the property of the selected image, the existence of scene change is detected by the detecting element 114. A gray-scale-conversion curve new in the calculation section 115 when scene change is detected from the image itself or its photometry information, or focus information is computed. When scene change is detected, the newly computed gray-scale-conversion curve is used in the calculation section 115. Moreover, since the gradation property of each image was changed by the gradation transducer 110 using the present gray-scale-conversion curve when scene change was not detected, a gray-scale-conversion curve can be computed to suitable timing, and a high-definition image can be obtained. Moreover, since it was made to carry out contraction processing of the image when detecting scene change from the selected image, while being made to low cost, small-scale and the image stabilized since minute change of an image was absorbed by carrying out contraction processing can be obtained for a processor. And since scene change was detected from the whole image from the specific region, scene change can be detected, without calling at a photographic subject location. Moreover, since the standard gradation curve ROM 116 which stores a standard gradation curve was formed, it can respond to an initialization situation etc.

[0075] Drawing for the block diagram in which drawing 7 - drawing 10 show the gestalt of the 2nd operation of this invention, and drawing 7 shows the configuration of the whole image pick-up system, the block diagram showing the configuration of an example of the detecting element which shows drawing 8 to

drawing 7 , and drawing 9 to explain similarity nature calculation of the histogram in the detecting element shown in drawing 8 , and drawing 10 are the block diagrams showing the configuration of an example of the Records Department which shows drawing 7 .

[0076] While replacing the image pick-up system of the gestalt of this operation with the buffer 105 for images in the image pick-up system in the gestalt of the 1st operation and forming the buffer 600 for the 1st image, the buffer 601 for the 2nd image, and the synthetic section (synthetic means) 602 Connect with a detecting element 114, the calculation section 115, a control section 117, and the gradation transducer 110, respectively, and the Records Department 603 is added. Furthermore, a detecting element 114 is considered as a different configuration from the gestalt of the 1st operation, since other configurations are the same as that of the gestalt of the 1st operation, the same reference number is given to the component which performs the same operation, and the detailed explanation is omitted.

[0077] In drawing 7 , it connects with the signal-processing section 109 through the synthetic section 602, and the buffer 600 for the 1st image and the buffer 601 for the 2nd image connect the buffer 600 for the 1st image to the photometry evaluation section 106 and the focusing point detecting element 107 further, while connecting with A/D converter 104. In addition, in drawing 7 , drawing 8 , and drawing 10 , the signal line which the signal line which the signal line shown as the continuous line of a thick wire shows video-signal Rhine, and is shown as the continuous line of a thin line shows control signal Rhine, and is shown with a broken line shows other data lines.

[0078] A user specifies photography conditions, such as image size and a frame number, through the external I/F section 118, and the image pick-up system shown in drawing 7 starts photography by pushing a shutter carbon button after that. The video signal acquired from CCD103 by this photography initiation is changed into a digital signal with A/D converter 104, and is transmitted and stored in the buffer 600 for the 1st image as an image for long duration exposure. With the gestalt of this operation, gradation width of face of the digitized signal is made into 12 bits like the gestalt of the 1st operation. The video signal stored in this buffer 600 for the 1st image computes exposure conditions and focus conditions by transmitting it to the photometry evaluation section 106 and the focusing point detecting element 107, respectively.

[0079] Next, the image of the 2nd sheet is photoed to the exposure conditions computed in the photometry evaluation section 106 by the predetermined exposure ratio, for example, exposure conditions which are set to 1/8, and the video signal is changed into a digital signal with A/D converter 104, and as a short-time exposure image, it transmits to the buffer 601 for the 2nd image, and stores in it.

[0080] The image for short-time exposure stored in the buffer 601 for a long duration exposure image and the 2nd image stored in the buffer 600 for the 1st image in the synthetic section 602 is read in order. First, it leaves the signal of the field below a predetermined threshold (for example, if it is 12-bit gradation "3890") as a fitness exposure field about a long duration exposure image. Next, the short-time exposure image corresponding to fields other than a fitness exposure field is read, the exposure ratio is amended (amending 8 times, when short-time exposure is set as one eighth of exposure ratios to long duration exposure, for example), and it compounds with the image of the proper exposure field of long duration exposure. The video signal compounded in this synthetic section 602 is transmitted to the signal-processing section 109, is processed like the gestalt of the 1st operation here, and generates the video signal of 3 tabular voice.

[0081] Like the gestalt of the 1st operation, the video signal generated in the signal-processing section 109 is chosen at intervals of predetermined time in the selection section 113, and is transmitted to a detecting element 114.

[0082] In a detecting element 114, like the gestalt of the 1st operation, compute predetermined property information from the selected video signal (image), and although the computed property information is compared with the property information already computed from the image chosen last time and the existence of scene change is detected When scene change is detected here, it judges whether property information similar with reference to the property information on the past currently recorded on the Records Department 603 is recorded, and those results are transmitted to a control section 117.

[0083] A control section 117 controls the gradation transducer 110 to read the gray-scale-conversion curve corresponding to the similar property information from the Records Department 603, when the property information which scene change is detected and is similar to the Records Department 603 exists based on the signal from a detecting element 114. moreover, when the property information which scene change is detected and is similar to the Records Department 603 does not exist The new gray-scale-conversion curve computed in the calculation section 115 while controlling to compute a new gray-scale-conversion curve from the image chosen in the selection section 113 in the calculation section 115, and to transmit to the gradation transducer 110, The property information on the image computed by the detecting element 114 is

transmitted to the Records Department 603, and both are saved as a group.
[0084] On the other hand, when scene change is not detected, the gradation transducer 110 is controlled like the gestalt of the 1st operation to continue the use of a gray-scale-conversion curve which is carrying out current use, without computing a new gray-scale-conversion curve in the calculation section 115. In addition, when a control section 117 detects initialization situations, such as a power up, it controls to read the gray-scale-conversion curve stored in the standard gradation curve ROM 116 in the gradation transducer 110.
[0085] In the gradation transducer 110, it changes so that the signal from the signal-processing section 109 may be adjusted to the gradation width of face of an output system based on the gray-scale-conversion curve obtained as mentioned above. With the gestalt of this operation, gradation width of face of an output system is made into 8 bits. The digital video signal outputted from this gradation transducer 110 is changed into the video signal of an analog with D/A converter 111, and is outputted to the output sections 112, such as a monitor and a videocassette recorder.
[0086] Drawing 8 is the block diagram showing the configuration of an example of the detecting element 114 shown in drawing 7 . This detecting element 114 has the histogram calculation section (histogram calculation means) 700, the buffer 701 for histograms, the decision section (decision means) 702, the similarity calculation section (similarity calculation means) 703, and the gray-scale-conversion curvilinear specification part (read-out means) 704. The histogram calculation section 700, the decision section 702, the similarity calculation section 703, and the gray-scale-conversion curvilinear specification part 704 are connected to a control section 117, respectively. Moreover, the histogram calculation section 700 is connected to the Records Department 603, the decision section 702, and the similarity calculation section 703 through the buffer 701 for histograms, respectively while connecting with the selection section 113 further. As for the decision section 702, it connects with the similarity calculation section 703 further, and it connects with the Records Department 603 and the gray-scale-conversion curvilinear specification part 704 further, and the similarity calculation section 703 connects further the gray-scale-conversion curvilinear specification part 704 to the Records Department 603.
[0087] In the detecting element 114 shown in drawing 8 , the histogram calculation section 700 captures a contraction image from the selection section 113 based on control of a control section 117, and computes the histogram of the contraction image. This histogram is transmitted to the buffer 701 for histograms, and is saved. The buffer 701 for histograms is a ring-like buffer which can record a histogram, and if a buffer fills, it is constituted so that it may overwrite from an old histogram.
[0088] Form status change-ization of the histogram from the buffer 701 for histograms is supervised, form status change-ization more than predetermined occurs, the decision section 702 judges it as what scene change produced, when the situation carries out count continuation of predetermined, and it transmits the decision result to a control section 117.
[0089] Here, when it is judged that scene change arose, the similarity calculation section 703 is controlled by the control section 117, and it asks for the similarity of the histogram on the buffer 701 for histograms judged that scene change arose, and the histogram currently recorded on the Records Department 603.
[0090] Drawing 9 is drawing for explaining this similarity computing method. Drawing 9 (a) The histogram on the buffer 701 for histograms, The histogram of the predetermined tolerance to the histogram, for example, **20% of range, is shown. The histogram on the buffer [ as opposed to / drawing 9 (b) shows the histogram of the past used as the candidate for a comparison currently recorded on the Records Department 603, and / a certain gradation value in drawing 9 (c) ] 701 for histograms, and its tolerance, The value of the histogram of the past set as the comparison object on the Records Department 603 is shown.
[0091] In the similarity calculation section 703, a sequential judgment of whether the value of the histogram of the past on the Records Department 603 is included in tolerance is made, changing a gradation value. the total of the gradation value included in tolerance here -- a whole floor tone value -- receiving -- predetermined -- comparatively, it judges that both histogram has high similarity, above, for example, 70% or more of case, in being other, it judges that similarity is low, and the result is transmitted to it to a control section 117. In addition, the tolerance used in case the similarity of the above-mentioned histogram is judged does not need to be fixed in a whole floor tone, it is large in an umbra or a bright section, or it is also possible to set up so that it may ignore, and to set up narrowly in halftone. In this case, the decision criterion in the halftone in which main photographic subjects probably exist becomes severe, and a gray-scale-conversion curve with more high similarity will be chosen.
[0092] Here, when it is judged that similarity is high, a control section 117 controls the gray-scale-conversion curvilinear specification part 704, chooses the gray-scale-conversion curve which is the above-

mentioned histogram and a group from the Records Department 603, and transmits the information to a control section 117. On the other hand, when it is judged to all the histograms currently recorded on the Records Department 603 that similarity is low, a control section 117 is controlled to compute a new gray-scale-conversion curve to the calculation section 115.

[0093] Drawing 10 is the block diagram showing the configuration of an example of the Records Department 603 shown in drawing 7 . This Records Department 603 has the property Records Department 800, the gray-scale-conversion curvilinear Records Department 801, the Monitoring Department (monitor means) 802, the hysteresis Management Department (hysteresis management tool) 803, and the cancellation control section (cancellation means) 804. In addition, the property Records Department 800 and the gray-scale-conversion curvilinear Records Department 801 constitute the property Records Department and a gray-scale-conversion curvilinear record means. The Monitoring Department 802, the hysteresis Management Department 803, and the cancellation control section 804 are connected to a control section 117, respectively. The property Records Department 800 connects with a detecting element 114, the Monitoring Department 802, and the cancellation control section 804, respectively, the Monitoring Department 802 connects with the gray-scale-conversion curvilinear Records Department 801 and the cancellation control section 804 further, respectively, and the cancellation control section 804 connects it to the gray-scale-conversion curvilinear Records Department 801 and the hysteresis Management Department 803 further. Moreover, the gray-scale-conversion curvilinear Records Department 801 connects with the calculation section 115, the hysteresis Management Department 803, and the gradation transducer 110 further, respectively.

[0094] At the Records Department 603 which shows drawing 10 , the property Records Department 800 records the property information on the image from a detecting element 114, and the gray-scale-conversion curvilinear Records Department 801 records the gray-scale-conversion curve from the calculation section 115 as a group, respectively. The Monitoring Department 802 supervises the residue of the property Records Department 800 and the gray-scale-conversion curvilinear Records Department 801, and notifies to a control section 117 that it becomes below a predetermined residue.

[0095] On the other hand, the hysteresis Management Department 803 manages the count read by the gradation transducer 110 as hysteresis information to the gray-scale-conversion curve on the gray-scale-conversion curvilinear Records Department 801. A control section 117 starts the cancellation control section 804 in response to a notice when the residue from the Monitoring Department 802 becomes below a predetermined residue. The cancellation control section 804 cancels the hysteresis information of the hysteresis Management Department 803, and recovers a residue while it chooses the property information which serves as the gray-scale-conversion curve and group while choosing fewest gray-scale-conversion curves of the count read by the gradation transducer 110 based on the hysteresis information from the hysteresis Management Department 803 and cancels those selected gray-scale-conversion curves and property information, respectively from the gray-scale-conversion curvilinear Records Department 801 and the property Records Department 800.

[0096] Thus, with the gestalt of this operation, since the image group of the extensive dynamic range exceeding the gradation width of face of CCD103 is obtained and the gray-scale-conversion curve was computed based on the scene change, a high-definition output image with little a white jump and black crushing can be obtained. Moreover, since similarity with the recorded property information was judged, and the gray-scale-conversion curve recorded corresponding to the property information was used when similarity was high when it recorded by making into a group the property information and the gray-scale-conversion curve of an image which were computed once and scene change occurred, the need of performing a useless operation is lost and it can be quickly adapted to scene change. Furthermore, since what has few operating frequency was preferentially eliminated from the hysteresis information used in the past in recording property information and a gray-scale-conversion curve, it is efficiently recordable also in the small amount of memory.

[0097] In addition, this invention is not limited only to the gestalt of the above-mentioned implementation, and many deformation or modification are possible for it. For example, the detecting element 114 was constituted from a gestalt of the 1st operation so that the existence of scene change might be detected based on a brightness value, but it can constitute, or it can also constitute so that the existence of scene change may be detected based on a motion vector, as it indicates drawing 11 that the existence of scene change is detected based on a histogram like the gestalt of the 2nd operation.

[0098] That is, the detecting element 114 shown in drawing 11 has the 1st image buffer 310, the 2nd image buffer 311, the motion vector calculation section (motion vector calculation means) 312, the buffer 313 for

motion vectors, and the decision section (decision means) 314. It connects with a control section 117, respectively, and the motion vector calculation section 312 and the decision section 314 connect the 1st image buffer 310 and the 2nd image buffer 311 to the motion vector calculation section 312, respectively while connecting with the selection section 113, respectively. Moreover, the motion vector calculation section 312 is further connected to the decision section 314 through the buffer 313 for motion vectors. In addition, in drawing 11 , the signal line which the signal line which the signal line shown as the continuous line of a thick wire shows video-signal Rhine, and is shown as the continuous line of a thin line shows control signal Rhine, and is shown with a broken line shows other data lines.

[0099] In the detecting element 114 shown in drawing 11 , the contraction image serially outputted from the selection section 113 Between the contraction images of two sheets which carried out sequential storing at the 1st image buffer 310 and the 2nd image buffer 311, and were stored in these 1st image buffer 310 and the 2nd image buffer 311 and which get mixed up serially The well-known motion detection processing which matches by dividing an image into a predetermined block in the motion vector calculation section 312 detects a motion vector for every block, and the result is transmitted and stored in the buffer 313 for motion vectors.

[0100] In the decision section 314, the buffer 313 lost-motion vector information for motion vectors is read, when the motion vector beyond a predetermined value is detected by the block more than a predetermined number, it judges that scene change arose, and the decision result is transmitted to a control section 117.

[0101] Moreover, in detecting the existence of scene change based on a histogram in this way, in case it computes a gray-scale-conversion curve based on a histogram in the calculation section 115, processing of carrying out the multiplication of the weighting factor to the field corresponding to the block with which the motion vector was detected, and giving gradation width of face preponderantly to the field is also possible.

[0102] Furthermore, a detecting element 114 can also be constituted so that the existence of scene change other than the above-mentioned brightness value, a histogram, or a motion vector may be detected using change of focus information etc.

[0103] Moreover, although the image of an extensive dynamic range was generated with the gestalt of the 2nd operation based on the image of two sheets with the short-time exposure image of a predetermined exposure ratio to the exposure conditions searched for from a long duration exposure image and its long duration exposure image Also when carrying out gray scale conversion of the usual image of one sheet like the gestalt of the 1st operation, the gestalt of this 2nd operation can be effectively applied, while being able to apply effectively, also when generating the image of an extensive dynamic range from the image group of different exposure of arbitration.

[0104] Moreover, the detecting element 114 was constituted from a gestalt of the 2nd operation so that the existence of scene change might be detected based on a histogram, but it can constitute, or it can also constitute so that the existence of scene change may be detected based on a motion vector and the existence of scene change may be detected using change of focus information etc., as it constituted or indicated drawing 11 that the existence of scene change was detected based on a brightness value like the gestalt of the 1st operation.

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[Translation done.]

* NOTICES *



1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

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DRAWINGS

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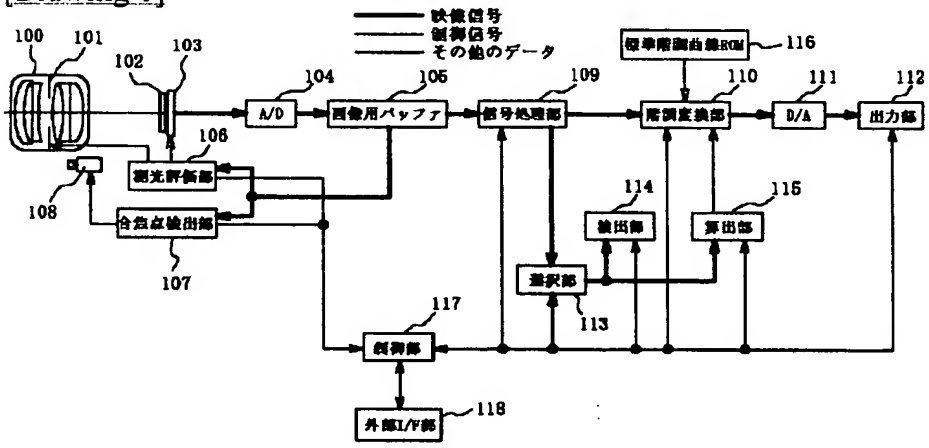
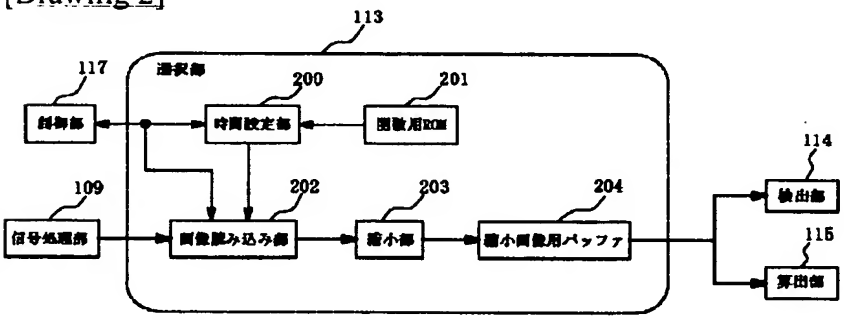
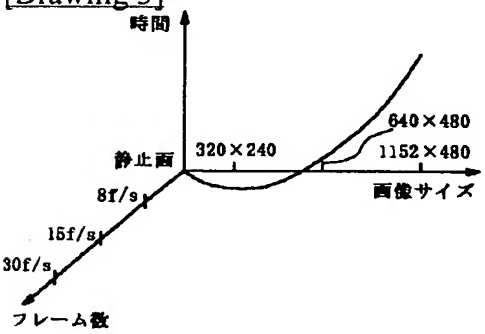
[Drawing 1]



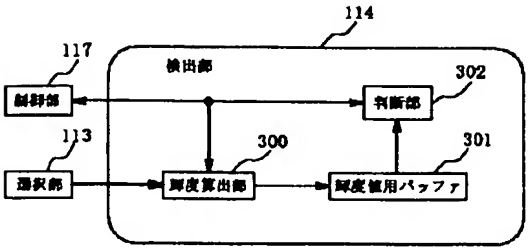

[Drawing 2]



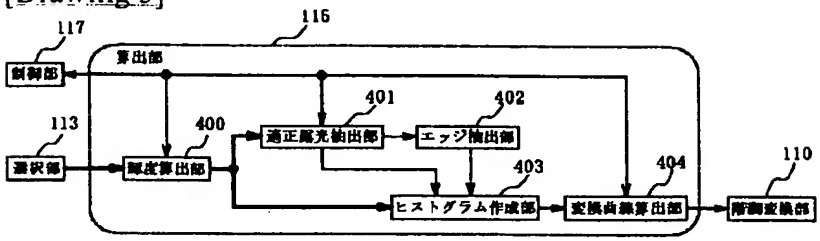

[Drawing 3]



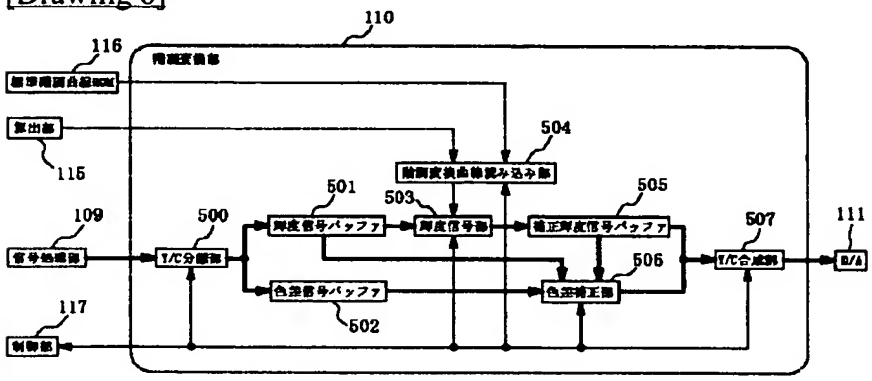

[Drawing 4]



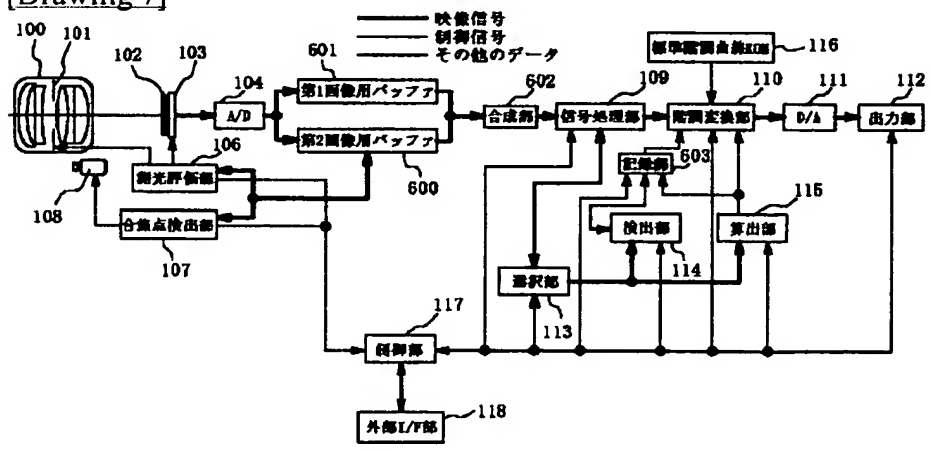

[Drawing 5]



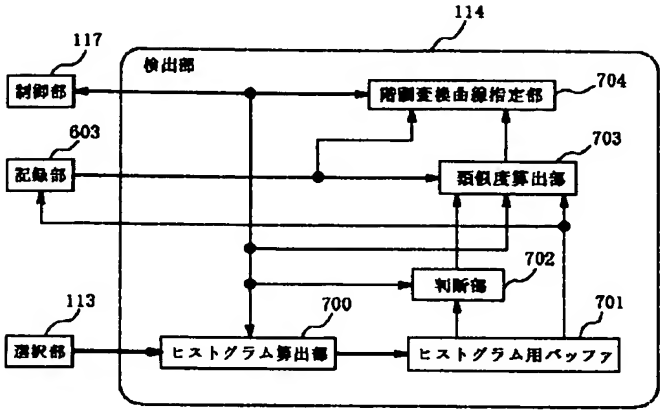

[Drawing 6]



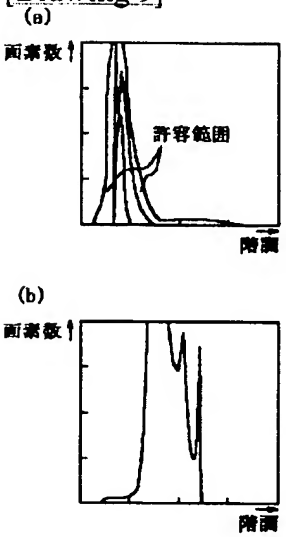

[Drawing 7]



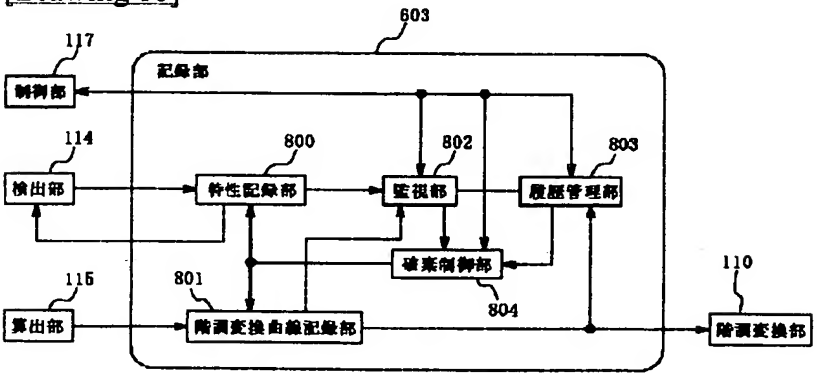

[Drawing 8]



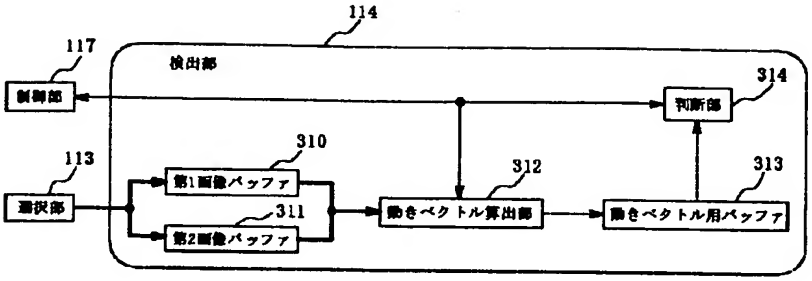

[Drawing 9]




[Drawing 10]




[Drawing 11]




[Translation done.]